

APPENDIX A
EPA APPROVAL MEMORANDUM
AND
HUMAN HEALTH RISK

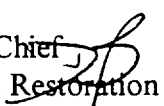
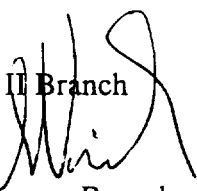
**U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I
JFK FEDERAL BUILDING, BOSTON, MA 02203**

MEMORANDUM

DATE: January 19, 1999

SUBJ: Raymark Industries, Inc. Superfund Site
Approval Memorandum to Perform an Engineering Evaluation/Cost Analysis for a
Non-Time Critical Removal Action

FROM: Ron Jennings, RPM 
Eve Vaudo, Enforcement Counsel 

THRU: Donald Berger, Chief 
Remediation and Restoration II Branch
Steven Novick, Acting Chief 
Emergency Planning and Response Branch

TO: Patricia L. Meaney, Director
Office of Site Remediation and Restoration

I. Subject

Investigations have determined that there has been a release of hazardous substances to the environment from the Raymark Industries, Inc. Superfund Site (the "Site") in Stratford, Connecticut. The Site consists of the Raymark facility and locations in the Town of Stratford where Raymark waste has come to be located. This memorandum documents the decision to proceed with an engineering evaluation/cost analysis ("EE/CA") for a non-time critical removal action ("NTCRA") at a portion of the Site. The EE/CA will be limited to evaluating alternatives for source control for the Shore Road and Housatonic Boat Club area which is a location that received manufacturing wastes as fill from the former Raymark Industries, Inc. Facility. The EE/CA will determine how EPA will provide a timely response to effectively minimize threats to public health or welfare or the environment which may result from the continuing release and threat of release of hazardous substances.

This memorandum is not a final Agency decision regarding the selection of a removal action for this Site.

II. Background

Site Description and History

The former Raymark Industries, Inc. Facility (the "Raymark Facility" or the "Facility") was located at 75 East Main Street in Stratford, Fairfield County, Connecticut (see Figure 1). From 1919 until September 1989, Raymark manufactured automotive and heavy brake friction components using asbestos, lead, copper, and a variety of adhesives and resins. As a result of manufacturing and waste disposal practices, soils at the Raymark Facility became contaminated with asbestos, lead, copper, polychlorinated biphenyls ("PCBs"), organic compounds, and other contaminants. Wastes produced as the result of manufacturing processes were routinely disposed of at the Facility and used to backfill low lying areas to create additional space for Facility expansion.

While the Raymark Facility was active, it was also common practice for the company to give away its excess manufacturing wastes for use as fill within the Town of Stratford. Although this practice was employed during most of the Facility's 70 years of operation, off site disposal of wastes increased as the low-lying areas within the Raymark Facility were filled. A RCRA §3013 Order was issued in 1987 which required Raymark to investigate the Facility to determine the extent of contamination. The facility closed manufacturing operations in 1989. In 1993, the Federal Agency for Toxic Substances and Disease Registry ("ATSDR") performed a health assessment. As a result of the assessment, ATSDR issued a Public Health Advisory for the Raymark Facility and locations around the Town of Stratford where Raymark waste had come to be located.

In response to ATSDR's Health Advisory, EPA and the Connecticut Department of Environmental Protection ("CTDEP") identified potential disposal locations, sampled numerous properties, and performed a series of removal actions from 1993 through 1996. These removal actions were performed at the former Facility and at residential, commercial, and municipal properties throughout the Town of Stratford where Raymark waste, with contaminants in excess of action levels, had come to be located. Removal actions were completed in 1996. EPA is currently continuing remedial activities on groundwater and other portions of the Site under an RI/FS.

The site was listed on the NPL on April 25, 1995.

Shore Road/Housatonic Boat Club

One of the locations where an interim removal action was conducted is an area south of the Raymark Facility, along Shore Road and the Housatonic Boat Club. (See Figure 2). In 1993, the CTDEP sampled soils in this area and found asbestos concentrations of up to 90%, as well as elevated levels of lead and PCBs. To address the risks posed by these contaminants, CTDEP

performed an interim removal action consisting of capping the area with a geotextile, then covering the geotextile with 6 inches of wood chips. This temporary capping, completed in 1994, was intended to be an interim measure. At that time, it was anticipated that a future permanent solution would be implemented as part of the Ferry Creek remedial action.

Currently, due to weather and use, the Shore Road and Housatonic Boat Club areas have been impacted and the temporary cap has been compromised. The 6 inch layer of wood chips is missing in some areas, exposing the geotextile which frequently shows some degree of damage. Of further concern is that the pavement of Shore Road, originally built on contaminated fill, is failing. The Town is reluctant to perform any repairs due to potential contaminant exposure. These potential contaminant exposures are of particular concern as the area receives considerable automotive and foot traffic. Shore Road continues to be used as a town road providing access to the Housatonic Boat Club, the Shakespeare Theater (located across Shore Road from the Boat Club), and several residences (see Figure 2). Outdoor events have been held along the grounds of the Shakespeare Theater which further attracts crowds that walk along Shore Road overlooking the Housatonic River.

III. Nature and Extent of Contamination

The areas of concern include the banks along the entire length of Shore Road, the Shakespeare Theater grounds, and the area surrounding the Housatonic Boat Club (the "Shore Road/Housatonic Boat Club area"). Results of surface soil sampling conducted in 1993, 1994, and 1997 are presented in Table 1 (see Figure 2 for sampling locations). Semi-volatile organic compounds (SVOCs), pesticides, PCBs, and elevated levels of some inorganics were found. Lead (38,700 ppm) and asbestos (90% of soil concentration) were two constituents found to present potential risks.

Ecological Assessment:

The environmental setting of the area was once a salt meadow marsh bordering the Housatonic River. A portion of the wetland has been completely filled displacing the channel of Ferry Creek to its present location. Portions of Shore Road are bordered by a salt water marsh. The Housatonic Boat Club, which has been built on fill, is bordered by the Housatonic River to the east.

An ecological risk assessment that is currently underway as part of the RI/FS process found sediments to be toxic to amphipods, oyster larvae, and clam larvae with the toxicity attributed to PCBs, dioxins, PAHs and a number of metals, including lead. Other risk assessment data found fiddler crab tissues with excess levels of PCBs, lead, copper and dioxin. There are numerous issues surrounding the long-term ecological impacts to nearby wetlands which are currently being addressed by various stakeholders. Because of these unresolved issues, the wetlands have not been included as a part of the proposed NCTRA.

IV. Preliminary Risk Screening

As part of the continuing RI/FS process, a draft baseline human health risk assessment has been completed for a large area bordering the Housatonic River which includes Shore Road and the Housatonic Boat Club. Because of concern of potential exposures to soils, and to evaluate the potential need of a NTCRA, EPA has conducted a separate risk screening for the Shore Road/Housatonic Boat Club area (see Attachment 1).

The risk screening was conducted for a current or future commercial worker. Other receptors evaluated included adult and older children using the area infrequently for recreation. The results of this screening found lead in the soils at concentrations that would result in a 94% probability that resulting blood lead levels would exceed acceptable levels. (EPA has determined that a probability greater than 5% is unacceptable). This screening also found asbestos at levels up to 90% in soil. (EPA's National Emission Standard for Hazardous Air Pollutants for Asbestos requires that any asbestos containing material be covered according to 40 CFR § 61.151(a)(3)).

It is noted that the risks presented above may not be a true estimate of the actual risk. An updated risk screening for the area will be performed concurrently with the proposed EE/CA.

V. Threat to Public Health, Welfare, or the Environment

Section 300.415(b)(2) of the NCP lists a number of factors for EPA to consider in determining whether a removal action is appropriate, including:

- * (i) actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
- * (iv) high levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
- * (v) weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released, and;
- * (vii) the availability of other appropriate federal or state response mechanisms to respond to the release.

An evaluation of the conditions at the Shore Road /Housatonic Boat Club area concluded that the above listed factors are applicable as described below.

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants - There is both the current and future potential for direct human exposure to contaminants in soils along and beneath Shore Road as well as the area surrounding the Housatonic Boat Club. All of these areas are contaminated with VOCs, SVOCs, dioxin, pesticides and inorganics. While past measures were taken to prevent access to the soils, weather and use of the area has compromised the interim capping efforts.

There is, therefore, a current and future potential for human exposure through direct contact and inhalation of soil, as well as the potential for exposure to animals.

(iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate - Table 1 presents the maximum concentrations of VOCs, SVOCs, dioxin, pesticides and inorganics found in surface soils. The preliminary risk screening was completed using surface soil data which found unacceptable levels of lead and asbestos. In areas where the interim cap has been compromised, this surface soil is subject to movement via surface water runoff and air transport. Because of this, there is currently a potential for pollutant migration.

(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released - Shore Road and the area surrounding the Housatonic Boat Club building are within the 100 year flood zone. There have been numerous occurrences of flooding in both of these areas. Precipitation is also believed to have the ability to mobilize contaminants where releases could reach the Housatonic River during flooding and rainstorm events. A risk assessment currently underway found elevated levels of site related contamination in both river sediments and in crab tissue. The Housatonic River is utilized for fishing and recreational boating.

(vii) The availability of other appropriate federal or state response mechanisms to respond to the release - There are no other known federal or state funds or response mechanisms available to finance this action. The Town of Stratford requested that an action be taken in the Shore Road/Housatonic Boat Club area to address the potential of contaminant exposure for both current use as well as for future redevelopment and reuse plans. CTDEP concurs with the Town's request for an action.

EPA and the CTDEP have agreed to sign a Memorandum of Agreement (MOA) establishing responsibilities for both EPA and the CTDEP for the completion of the NTCRA at the Shore Road/Housatonic Boat Club area, the investigation and characterization of the area, and for implementation of a response action. CTDEP has agreed to commit \$1 million dollars toward the implementation of the ultimate response action.

Consequently, based upon the NCP factors listed and described above, a potential threat exists to public health or welfare or the environment at the Shore Road/Housatonic Boat Club area and, therefore, a removal action is appropriate to abate, prevent, minimize, stabilize, mitigate, or eliminate such threat(s). In particular, a removal action is necessary to control and contain the release of hazardous substances along Shore Road and the Housatonic Boat Club area through source control measures.

This removal action is designated as non-time critical because more than six months planning time is available before on-site activities must be initiated. As a result, EPA will require the

completion of an engineering evaluation/cost analysis (EE/CA) pursuant to 40 C.F.R. Section 300.415(b)(4)(i).

VI. Scope of the Proposed EE/CA

The purpose of the EE/CA is to evaluate alternatives for source control measures at a portion of the Site, including 1) the banks along and the area beneath Shore Road, 2) the Shakespeare Theater grounds, and 3) the area surrounding the Housatonic Boat Club.

The EE/CA will consider alternatives which meet the following removal action objectives:

- * prevent, to the extent practicable, the further release of contaminants into the groundwater, surface water, and sediments;
- * prevent, to the extent practicable, the discharge of any plume into the Housatonic River;
- * prevent, to the extent practicable, direct contact with, ingestion of, and inhalation of contaminated soils;
- * prevent, to the extent practicable, the release of contaminants from the area into the Housatonic River that occurs through flooding; and
- * prevent, to the extent practicable, continued ecological impacts from the release of contaminants from the area into the Housatonic River and nearby wetlands.

Pursuant to EPA guidance on performing EE/CA's, alternatives will be evaluated based upon relative effectiveness, implementability, cost, and compliance with ARARs to the extent practicable. Further, alternatives which exceed \$2 million dollars will be evaluated to determine their consistency with future remedial actions to be taken at the Site.

VII. Estimated Costs

The EE/CA for the proposed NTCRA at a portion of the Site will be developed by an EPA contractor under the Response Action Contracts (RACs) program. Either EPA, EPA's contractor, or a combination of both will be responsible for procurement and oversight of the response contractor.

Extramural costs associated with the preparation of an EE/CA for this portion of the Site are expected to be \$100,000. The costs associated with the response action are unknown but could approach \$10 million dollars. The costs will largely be dependent upon the completion of an updated risk screening which would be developed concurrently with the EE/CA.

VIII. Enforcement Strategy

In January 1997, the U.S. sued Raymark for past and future cleanup costs at the Site. The Raymark Facility was also named as a defendant to facilitate a judicial sale of the property. In August 1998, a Connecticut federal district court ordered that the property be sold and certain proceeds paid to the U.S. After the sale of the property, the U.S. intends to focus on pursuing Raymark's insurers.

EPA has also identified and sent information requests to numerous owners of small commercial properties along Ferry Creek. EPA has not yet confirmed the extent to which it will pursue these commercial property owners.

IX. Recommendation

In light of the facts discussed above, the case team recommends that you approve the initiation of an EE/CA for the Shore Road /Housatonic Boat Club area portion of the Site.

1-22-99
Date

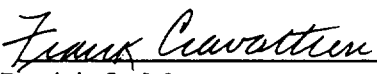


 Patricia L. Meaney
Director, Office of Site Remediation and Restoration
U.S. EPA - New England Region

TABLE 1

Surface Soil Maximum Concentrations

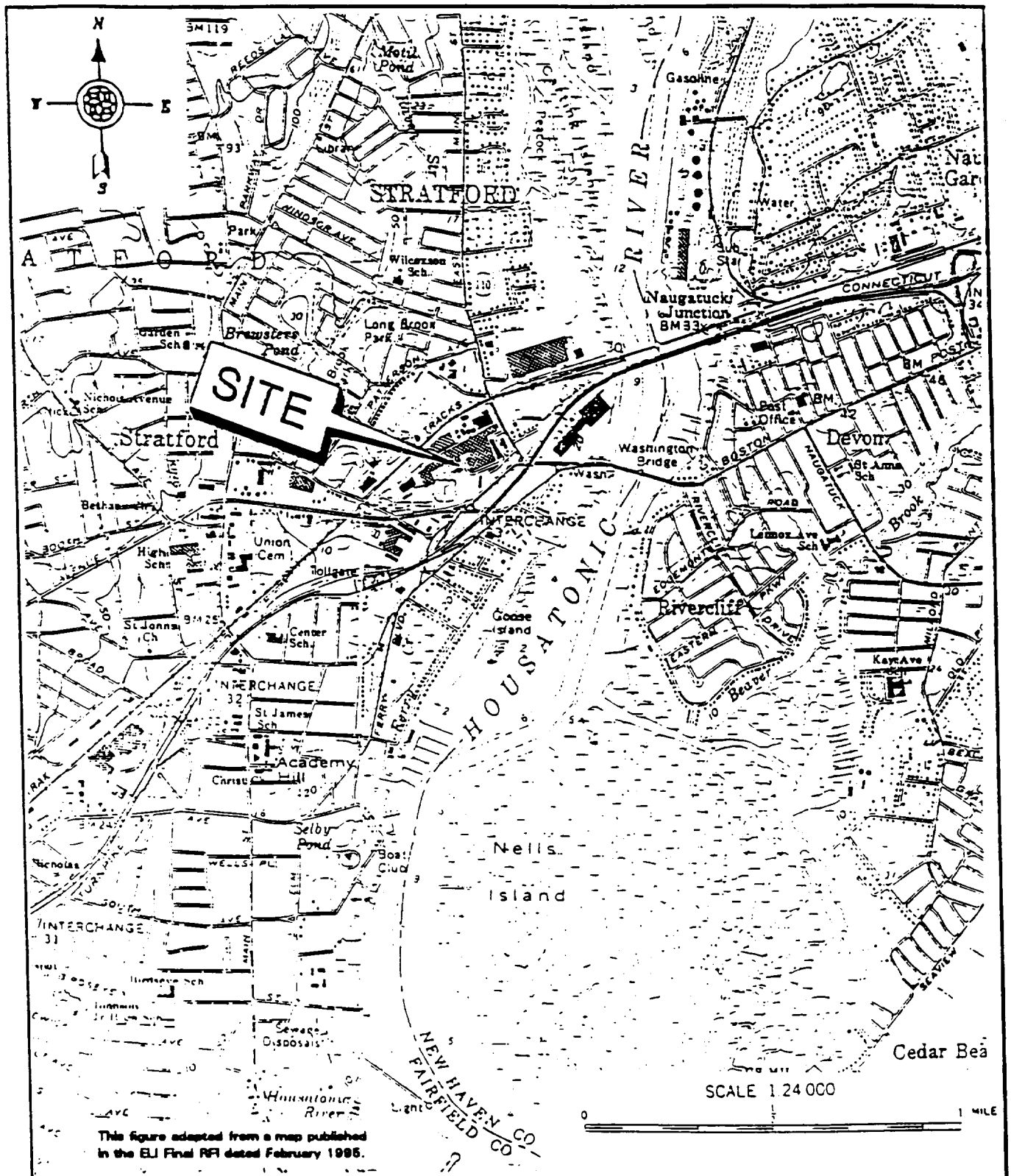
Constituent	Maximum Concentration
VOCs (ppb):	
2-butanone	31

SVOCs (ppb):	
2-methylphenol	89
4-methylphenol	2100
1,2,4-trichlorobenzene	38
naphthalene	65
acenaphthylene	260
acenaphthene	2000
dibenzofuran	930
fluorene	2000
phenanthrene	28000
anthracene	5400
carbazole	2700
di-n-butylphthalate	2700
fluoranthene	46000
pyrene	36000
butylbenzylphthalate	350
benzo(a)anthracene	18000
chrysene	19000
bis(2-ethylhexyl)phthalate	6800
benzo(b)fluoranthene	17000
benzo(k)fluoranthene	15000
benzo(a)pyrene	15000
indeno(1,2,3-cd)pyrene	10000
dibenz(a,h)anthracene	270
benzo(g,h,i)perylene	1900

asbestos (%)	90
dioxin (ppb) - tox equiv.	9.012

Constituent	Maximum Concentration
Inorganics (ppm):	
aluminum	14100
arsenic	16.8
barium	16800
beryllium	0.56
cadmium	2
calcium	58200
chromium	199
cobalt	29.9
copper	49300
iron	39400
lead	25300
magnesium	54700
manganese	462
mercury	1
nickel	364
potassium	10600
selenium	2.6
silver	1.5
sodium	21100
thallium	0.31
vanadium	59.6
zinc	10700

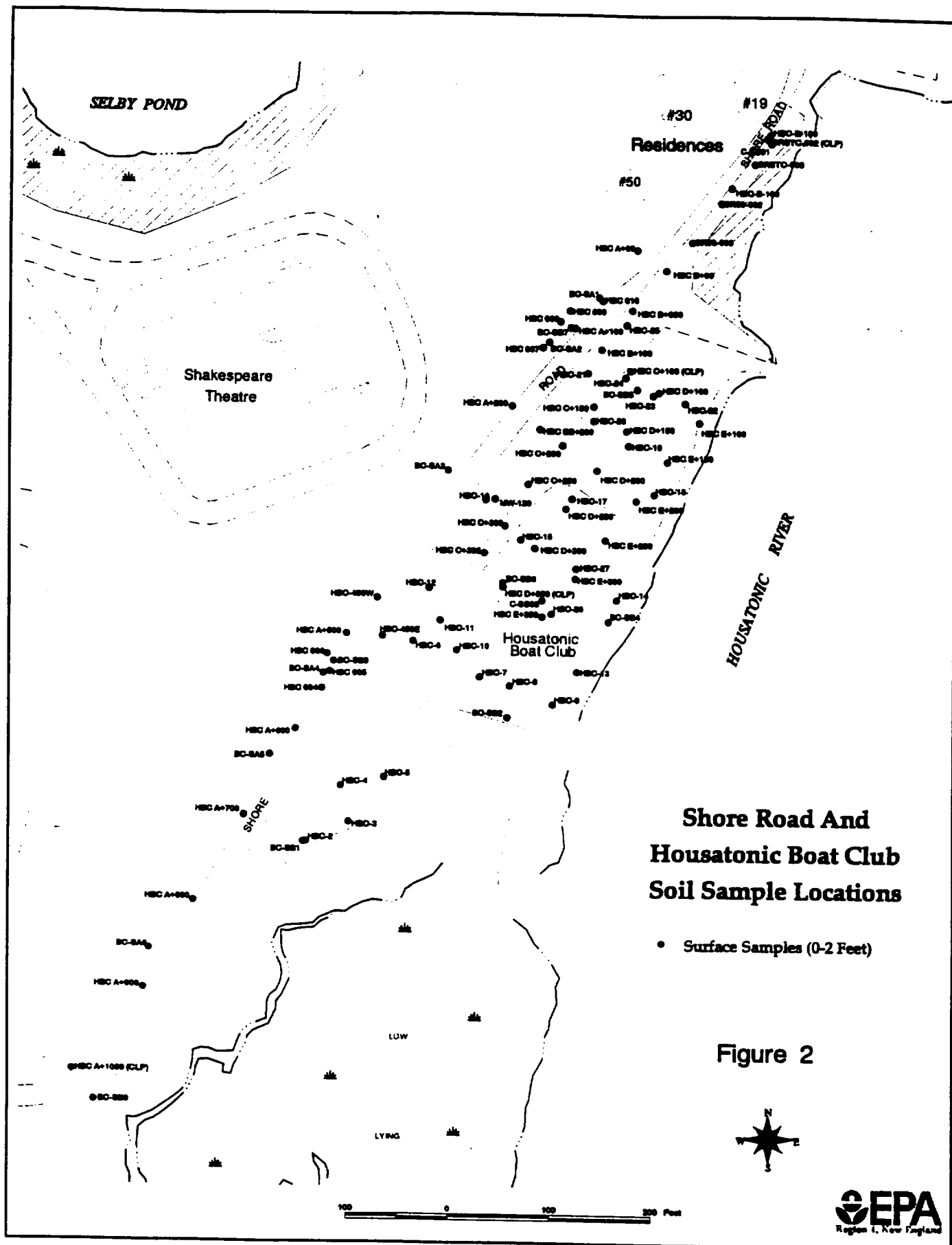
Pesticides/PCBs (ppb):	
delta-BHC	2.9
aldrin	0.49
endosulfan I	4.9
dieldrin	6.9
4,4'-DDE	130
endrin	0.69
endosulfan II	2.1
4,4'-DDD	14
4,4'-DDT	200
methoxychlor	50
endrin ketone	2.6
endrin aldehyde	82
alpha-chlordane	4.7
gamma-chlordane	35
aroclor 1260	26000
aroclor 1262	38000
aroclor 1268	119000



**FACILITY LOCATION MAP
RAYMARK INDUSTRIES, INC.
REMEDIAL INVESTIGATION
STRATFORD, CONNECTICUT**

 **Halliburton NUS
CORPORATION**

FIGURE 1



Memo

To: Ron Jennings, RPM
From: Margaret McDonough
Date: December 21, 1998
Subject: Human Health Risks at Ferry Creek OU, Area C (Housatonic Boat Club)

The highest potential risks via contact with contaminants in the surface soils at the Housatonic Boat Club were estimated for a current or future commercial worker. Other receptors evaluated include adult and older children using the area infrequently for recreation. A summary of potential risks is presented below.

Lead

The draft baseline risk assessment prepared for the Ferry Creek OU3 shows that lead concentrations are within the range of acceptable lead-in-soil concentrations, if exposure is assumed to occur randomly across the entire 15 acre area.

I have taken a closer look at the risk assessment for Area C, the Housatonic Boat Club for the purpose of assessing whether "hotspots" exist within this part of the Ferry Creek OU. Data from across 15 acres was averaged together in the risk assessment; thus, the high concentrations have been "averaged out." If the assumed worker exposure (250 days/year over 25 years) could potentially occur over a smaller area, then the potential risk from lead has been significantly underestimated for two "subareas" of the Housatonic Boat Club as shown in the attached figure (Figure 1).

I have recalculated the predicted risks from exposure to lead-in-soil for the two lead "hotspots" shown in Figure 1. The probability that blood lead levels, applicable to women of child bearing age and protective of a fetus, would be unacceptable in the areas bordering the wetlands ("Lead Hotspot #1) is greater than 94% (Table 1). The predicted probability in the smaller area shown along Shore Rd.(Lead Hotspot #2) is greater than 84% (Table 2). EPA has determined that a probability greater than 5% is unacceptable. Again, these risks are based on the assumption that chronic exposure may occur in each of these subareas rather than, on average, across the entire site.

Asbestos

Asbestos occurs in approximately 40 % of the samples in Area C. Asbestos concentrations are

expressed as percent by volume; the maximum concentration is 90%. The detection limit is 1%. Asbestos contamination also appears to occur in smaller areas of the Boat Club. There are two "subareas" in addition to the areas with high lead described above, in which asbestos greater than 1% occurs. (See Figure 1.)

Asbestos exposure via inhalation has been shown to cause lung cancer and pleural mesothelioma in humans and animals. By the ingestion route, adverse health effects are less certain. However, no health based criteria exist for exposure to asbestos in soil. A significant threat to human health may occur when friable asbestos fibers become airborne and exposure then occurs via inhalation. EPA's National Emission Standard for Hazardous Air Pollutants for Asbestos (Section 112 of the Clean Air Act) defines asbestos containing material as any material containing 1% or greater asbestos as measured by polarized light microscopy. This standard requires that any asbestos containing material be covered according to Section 61.151(a)(3).

Carcinogenic Risk

Total carcinogenic risk is approximately 1×10^{-5} . The risk is attributable to PAHs and PCBs. The higher levels of PCBs are co-located with the larger lead hotspot. The risks from PCBs in this subarea alone are approximately 1×10^{-5} .

Noncarcinogenic Risk

Noncarcinogenic risks are below Hazard Index of one.

Attachments

TABLE I

Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

SITE NAME: AREA C: HOUSATONIC BOAT CLUB

LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT, "HOTSPOT #1"

RECEPTOR: FUTURE COMMERCIAL WORKER - REASONABLE MAXIMUM/CENTRAL TENDENCY EXPOSURES

DATE: JUNE 3, 1998 December 21, 1998 KMM SURFACE SOIL

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult, central} = PbB_{adult, 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s) / AT$

and

$$PbB_{fetal, 0.95} = PbB_{adult, central} \times GSD_{adult}^{1.645} \times R_{fetal/maternal}$$

Exposure Parameter	Description (units)	GSD _{adult} = 1.8 - 2.1; PbB _{adult, 0} = 1.7 - 2.2			
		Adult 1	Adult 2	Adult 3	Adult 4
PbB _{adult, 0}	Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL)	1.7	1.7	2.2	2.2
PbS	Site-specific soil lead concentration (mg/kg)	9534	9534	9534	9534
BKSF	Biokinetic slope factor (ug/dL per ug/day)	1380	1380	1380	1380
IR _s	Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day)	0.4	0.4	0.4	0.4
AF _s	Absolute gastrointestinal absorption fraction (unitless)	0.050	0.050	0.050	0.050
EF _s	Exposure frequency (days/year)	0.12	0.12	0.12	0.12
AT	Averaging time (days/year)	250	250	250	250
GSD _{adult}	Estimate of individual geometric standard deviation among adults (unitless)	365	365	365	365
R _{fetal/maternal}	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (unitless)	1.8	2.1	1.8	2.1
PbB _{adult, central}	Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL)	0.9	0.9	0.9	0.9
PbB _{fetal, 0.95}	Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL)	3.97	3.97	4.47	4.47
		17.4	17.4	17.9	17.9
		9.39	12.10	10.58	13.63
		41	53	42	55

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EF_s is less than 1 day/week.

PROBABILITY OF EXCEEDING ACCEPTABLE LEVEL: 94% 97% 94% 97%

00021

TABLE 2

Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil

SITE NAME: AREA C: HOUSATONIC BOAT CLUB ; HOTSPOT #2

LOCATION: FERRY CREEK, STRATFORD, CONNECTICUT

RECEPTOR: FUTURE COMMERCIAL WORKER - REASONABLE MAXIMUM/CENTRAL TENDENCY EXPOSURES ; SURFACE SOIL

DATE: JUNE 3, 1998 December 21, 1998 MYA

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS: $PbB_{adult, central} = PbB_{adult, 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s) / AT$

and

$$PbB_{fetal, 0.95} = PbB_{adult, central} \times GSD_{adult}^{1.045} \times R_{fetal/maternal}$$

Exposure Parameter	Description (units)	GSD _{adult} = 1.8 - 2.1; PbB _{adult, 0} = 1.7 - 2.2			
		Adult 1	Adult 2	Adult 3	Adult 4
PbB _{adult, 0}	Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL)	1.7	1.7	2.2	2.2
PbS	Site-specific soil lead concentration (mg/kg)	5200	5200	5200	5200
BKSF	Biokinetic slope factor (ug/dL per ug/day)	1380	1380	1380	1380
IR _s	Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day)	0.4	0.4	0.4	0.4
AF _s	Absolute gastrointestinal absorption fraction (unitless)	0.050	0.050	0.050	0.050
EF _s	Exposure frequency (days/year)	0.12	0.12	0.12	0.12
AT	Averaging time (days/year)	250	250	250	250
GSD _{adult}	Estimate of individual geometric standard deviation among adults (unitless)	365	365	365	365
R _{fetal/maternal}	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (unitless)	1.8	2.1	1.8	2.1
PbB _{adult, central}	Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL)	0.9	0.9	0.9	0.9
PbB _{fetal, 0.95}	Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL)	3.07 10.24	3.07 10.24	4.47 10.74	4.47 10.74
		0.39 15.66	12.10 20.27	10.58 16.4	13.63 21.26

PROBABILITY OF EXCEEDING ACCEPTABLE LEVEL 85% 86% 87% 87%

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EF_s is less than 1 day/week.